



Wetlands – Bigger is not Necessarily Better

By Ann Sullivan



Wetlands in West Bragg Creek. Photo by Kathryn Hull (Cows and Fish)

To the person who wants to hike without getting wet feet, or the developer who wants solid ground on which to build, wetlands are a nuisance – soggy areas that seem little more than breeding grounds for mosquitoes. But to the habitat and organisms they support – including us humans! – wetlands are crucial players in the ecosystem. They work hard in their unassuming way, protecting land from both flood and drought, purifying water, creating habitat and recharging groundwater. Sadly, they’re often in danger of being destroyed in favour of development and “progress.”

Wetlands were the focus of a recent symposium hosted by Mount Royal University in Calgary on World Wetlands Day (February 2, 2021). Among the presenters was Dr. Nandita Basu, an associate professor and researcher in water sustainability at the University of Waterloo. In the United States, Basu says, more than 90 percent of prairie wetlands have been converted to agricultural land since the 1800s. That number is only slightly lower on the Canadian prairies. Ducks Unlimited Canada estimates that in settled areas of Canada, up to 70 percent of our wetlands have already been destroyed or degraded.¹

According to numbers presented by Dr. Pascal Badiou (a research scientist with the Institute for Wetland and Waterfowl Research, Ducks Unlimited Canada) at the symposium, prairie Canada

¹ <https://www.ducks.ca/our-work/wetlands/>

has lost approximately 488,000 hectares of wetlands during the last 60 years; this includes 133,000 hectares lost in southern Alberta.

Small prairie wetlands are often dry for at least part of the year, leaving them without sufficient environmental protection. “It’s much easier to get a permit to develop over a smaller wetland,” Basu said, a situation that’s “fairly ubiquitous,” wherever pressure to develop exists.

These small wetlands don’t exist on their own – they’re often part of a wetland complex or “wetlandscape,” land that’s made up of wetland areas of different shapes and sizes. “It’s important to think about them together,” Basu said. “Their connections and network of structures matter. You change the wetlandscape when you change that structure.”



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In December 2018, the government of Alberta updated its [Wetland Mitigation Directive](#) in order to “inform planning and decision-making to avoid and minimize negative impacts to wetlands and, where necessary, replace lost wetland area and value.” The directive provides a matrix that allows a Qualified Wetland Science Practitioner (QWSP) to determine the size of replacement wetlands.

Logistically and economically, it may be more feasible for developers to replace 10 small, drained wetland areas with one big one. But research by Basu and her colleagues has shown that bigger is not necessarily better when it comes to wetlands. Their meta-analysis of wetlands showed that, on an area basis, smaller wetlands are better at purifying water. For example, 10 1-hectare wetlands could remove more nitrogen and phosphorus than 1 10-hectare wetland. Why? The answer is in the muck. “Sediments is where the action happens in a wetland,” Basu said. And since smaller wetlands have a smaller water-to-sediment ratio, it follows that they have more sediment-loving, nutrient-removing microbes per hectare than larger wetlands.

Another concept that Basu presented at MRU’s World Wetlands Day Symposium was the principle that “smaller wetlands have high perimeter to volume ratios, providing more surface area through which water can infiltrate into groundwater.” Therefore, these smaller wetlands are not only disproportionately important for water treatment, but also for groundwater recharge and resiliency to both flood and drought.

This doesn't mean that small wetlands are the only kind worth preserving. "Size matters," Basu said, but variety is important too, as is the distribution of wetlands. "There's a reason nature created different sizes [of wetlands] and we want to protect that."

Research by Basu and other scientists has shown that wetlands, even those with "degraded ecological characteristics," still help to purify water and mitigate flood and drought conditions in surrounding areas. She argues that we should not destroy urban wetlands just because they're not as pristine as, say, the undisturbed wetlands in a national park. "Wetlands near highly developed areas provide important services," she said. "If you restore or protect wetlands close to farming and urban areas, you get more benefit."

Basu notes that development pressure is strong, not only in southern Ontario, where she lives, but across the country and around the world.

Dr. Rich Petrone, a professor in Geography and Environmental Management at the University of Waterloo, is currently doing research on alpine wetlands. Petrone's project was featured in an [Eyes on the Elbow article in March 2018](#). He agrees with Basu that development – not just major projects like parking lots, buildings and roads – can take a toll on wetlands. Even relatively minor secondary roads and recreational trails can disrupt the flow of water. "They can have significant cumulative effects," Petrone said, effects that are sometimes so gradual that they only become evident over long periods of time. That's why he's keen to continue his research project for as long as possible.

Petrone has found that alpine wetlands, like those found in the headwaters of the Elbow River, play an important role in controlling "downstream yield." In other words, they help regulate flow in a watershed by holding and releasing water in a way that allows for both flood and drought mitigation. "Wetlands are important to the whole water story that affects everyone," he said.

Petrone noted that the top concern of watershed management groups he's spoken to is around levels of disturbance, whether that disturbance comes from development, timber harvesting or off-highway vehicle (OHV) use. He is concerned that current buffer regulations may not be adequate because of variations in geological and soil conditions.

In another corner of Kananaskis Country, Dr. Cherie Westbrook, a professor and the director of NSERC CREATE for Water Security at the University of Saskatchewan, is studying the "co-evolution of ecological and hydrological processes that explain wetland structure, function and resilience." Her work helps to inform discussion about wetland conservation, management and restoration.



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For the past 16 years, Westbrook's primary research site has been a "beautiful peatland" site near Sibbald Fen that's about 13,000 years old. Like Petrone, she sees the value in gathering data over a long period of time in order to better understand an area. Over the years, she and her team have seen changes in variables such as water table depth and beaver population in their study area.

Like Basu, Westbrook says sediment is key to wetland health, and beavers play a part in the system by preventing and reducing degradation to the land. "Beaver both create and enhance wetlands," Westbrook said. Their work helps to regulate the flow of water and sediment and keeps streams from becoming simple "tubes" that carry water and

sediment downstream. Like wetlands, however, beavers are often seen as a nuisance.

Although Westbrook is a scientist, not a beaver advocate, she'd like to change the negative image of both beavers, which play a role in wetland preservation, and wetlands themselves, which she says are "an undervalued part of the landscape."

Westbrook would like to see more information about wetlands in Kananaskis Country and Alberta. "I think we don't talk about [wetlands] enough, to be quite frank," she said. She's spent time mapping them, but said it's still hard to gather data on Alberta wetlands. "How are you supposed to protect something if you haven't even inventoried the resource?"

As the song says, you don't know what you've got till it's gone. And so it is with wetlands, whose loss continues close to home and around the world. The question remains: Are we doing enough to protect "wetlandscapes" in the Elbow River watershed and elsewhere? Not just the big ones, but the little ones, too, and the natural landscapes that connect them.